REMARKS

A. Request for Reconsideration

Applicant has carefully considered the matters raised by the Examiner in the outstanding Office Action but remains of the position that patentable subject matter is present. Applicant respectfully requests reconsideration of the Examiner's position based on the amendments to the claims and the following remarks.

B. The Invention

The present invention is directed to an ink-jet recording apparatus and ink-jet recording method having a plurality of recording modes each with a different recording speed in each mode. In one of the novel aspects of the invention, the intensity of the exposing radiation is varied based on the recording mode.

An example of the image forming method of the invention is illustrated in Figure 1 of the application where the ink-jet image is formed employing 4 passes in total. In the first pass of the recording head, ink is jetted onto the substrate and the ink on this substrate is exposed to radiation. In the second pass, additional ink is jetted onto the same area as the first ink, and both the first ink and the second ink layers are exposed to radiation. Thus, the ink jetted in the first pass is

exposed twice (exposed during the first and second passes), while the ink jetted in the second pass is exposed only during the second pass. Successive ink layers are therefore formed in the same portion of the recording material, each successive layer having been exposed a different number of times.

When employing an image forming method that forms images by jetting and irradiating successive ink layers on the same portion of the recording material, Applicant discovered that the exposure intensity must be varied depending on the recording speed (i.e., number of passes) in order to form a quality image. For example, Applicant has discovered that the exposure intensity per pass must be lowered as the number of passes increases in order to maintain a constant total amount of energy that reaches the recording material.

C. Claim Status and Amendments

Claims 1-9 are presented for further prosecution.

Claims 1 and 6 have been amended to recite that the ink image is formed by exposing the ejected ink a plurality of times. Support for this amendment can be found in Figure 1 and at page 5, line 11 to page 7, line 6 of the application.

D. The Office Action

Claims 1-9 had been rejected as being unpatentable over Kurashima (US 5,844,585) in view of Mills (US 2003/0035037).

Kurashima had been cited to teach an image forming method that forms an image at different resolutions. Mills had been cited to teach an image forming method that reduces or increases the pulses per second of the exposure device depending on the speed of the recording head to maintain a constant amount of energy per pass. The Examiner had taken the position that it would be obvious to vary the exposing device of Kurashima as taught by Mills.

1. Kurashima and Mills do not teach or suggest forming an image by exposing the ink a plurality of times, and varying the exposure intensity based on the recording mode

Applicant has discovered that a superior image is formed when the exposure intensity is varied depending on the recording mode. For example, Applicant has discovered that the exposure intensity per pass must be lowered as the number of passes increases in order to maintain a constant total amount of energy that reaches the recording material. The effects of the present invention can be seen by comparing Inventive method 3 in Table 2 at page 59 with Comparative method 6 in Table 3 at page 61 of the application.

Inventive method 3 has a pass frequency of 8 (image formed by 8 back-and-forth movements of the recording head), a carriage speed of 200 mm/s and an image recording speed of 25 relative to the 100 of method 1. For the sake of simplicity, the total amount of energy per unit area for Inventive method 3 is 200 (8 passes × 25 intensity per pass).

In comparison, Comparative method 6 has the same pass frequency and the same carriage speed, but the relative image recording speed was 100, 4 times greater than Inventive method 3. Thus, the total amount of energy per unit area for Comparative method 6 is 800 (8 passes × 100 intensity per pass). Thus, the recording material received much more energy per unit area for Comparative method 6 than Inventive method 3.

Inventive method 3 produced an excellent image in terms of roughness, glossiness, density and bleeding resistance compared to Comparative method 6 (Table 5, page 67). The inferiority of Comparative method 6 is due to the fact that the relative exposure intensity (i.e., the intensity per pass) was too high compared to that of Inventive method 3, and thus, the recording material received a total amount of energy that was too high.

As shown by comparing Inventive method 3 and Comparative method 6, Applicant has discovered that the relative exposure intensity (intensity per pass) must be varied depending on the recording speed (i.e., number of passes or carriage speed) in

order to produce an excellent image. In other words, comparing Inventive method 3 and Comparative method 6 shows the criticality of the exposure intensity per pass for a given pass frequency and a given carriage speed.

Applicants respectfully submit that Kurashima and Mills do not teach or suggest varying the exposure intensity based on the recording speed when forming images by exposing the ink a plurality of times as recited in claims 1 and 6. Instead, Kurashima teaches a mathematical equation that is used to record at different resolutions. Mills teaches increasing or decreasing the number of pulses per second as the carriage head accelerates or decelerates to maintain a constant amount of energy per unit area. Kurashima and Mills do not teach or suggest the relationship between the relative intensity and recording speed (e.g., pass frequency and carriage speed) shown by comparing Inventive method 3 and Comparative method 6.

Applicant therefore respectfully submits that those skilled in the art would not recognize the benefits of the present invention shown by comparing Inventive method 3 and Comparative method 6 in Tables 2 and 3 of the application. Applicant therefore respectfully submits that a combination of Kurashima and Mills does not teach or suggest varying the exposure intensity when forming images by exposing the ink a plurality of times as recited in claims 1 and 6.

E. Timeliness of Response

The 3-month period for reply to the Office Action expired on Saturday, October 22, 2005. The 3-month period is therefore extended until Monday, October 24, 2005. This Response is therefore being filed within the 3-month period.

F. Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance and such action is respectfully requested. Should any extensions of time or fees be necessary in order to maintain this Application in pending condition, appropriate requests are hereby made and authorization is given to debit Account # 02-2275.

Respectfully submitted,

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